

Avifauna of the Foja Mountains of western New Guinea

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SUMMARY.—We summarise the results of 105 days of ornithological field survey in the Foja Mountains of Indonesian New Guinea in 1979, 1981, 2005, 2007 and 2008, with observations ranging from the foothills at Kwerba (73 m) to one of the western summits at 2,175 m. Our results total 237 confirmed species, with another five requiring confirmation, and a new, distinct population of a *Ducula* pigeon. We provide notes on species of distributional, ecological or behavioural interest and also examine the presence / absence of montane bird species in New Guinea's northern coastal ranges, in which the Foja range occupies a central position. Foja harbours 46 confirmed montane bird species. By contrast, we obtained the following totals for adjacent northern ranges: Wandammen (33), Cyclops (19) and Bewani / Torricelli (28). The Foja Mountains are the third most species-rich outlying range in New Guinea, after the Huon uplands (72 montane species) and Bird's Head uplands (65). The only two species unexpectedly absent from Foja are Superb Bird-of-Paradise *Lophorina superba* and Midget Myzomela *Myzomela adolphinae* (which occur both to the west and east in the northern ranges). Further study should focus on the summits in the eastern sector and the lower montane zone at 800–1,200 m. Finally, the Cyclops and Wandammen mountains are under-surveyed and merit additional field work, which should generate many species additions to these isolated montane environments. Conservation efforts for the Foja Mountains should focus on preserving extensive contiguous tracts of upland forest to conserve both restricted-range upland biota and the ecosystem services generated by this extensive massif.

New Guinea, the largest tropical island, exhibits an array of mountain ranges of varying height, extent and degree of isolation (Fig. 1). New Guinea's diverse physiography and equatorial situation has fostered avian speciation and subspecific differentiation highlighted over the last century by Mayr (1941, 1942, 1963), Rand & Gilliard (1967), Diamond (1972, 1985), Coates (1985, 1990) and Beehler *et al.* (1986). It appears that New Guinea's main cordillera and adjacent outlying ranges have together acted as an evolutionary engine (Diamond 1985) much like the Andes and its outliers (Garcia-Moreno *et al.* 1999), albeit on a lesser scale.

The outlying ranges of New Guinea constitute a frontier of ornithological exploration (Diamond 1969, 1982, 1985, Pratt 1982, Beehler *et al.* 2007, Beehler & Prawiradilaga 2010). Diamond (1985) reviewed many of the interesting aspects of New Guinea's 15 outlying mountain ranges, which has encouraged follow-up field and museum studies. Of particular interest are those isolated northern ranges (Fig. 1) that include, from west to east, the Wandammen, Van Rees, Foja, Cyclops, Bewani and Torricelli ranges—extending from northern Papua (Indonesia) into north-west Papua New Guinea (hereafter PNG). Here we refer to this central group of ranges as the 'north coastal ranges' (from which we omit the mountains of the Bird's Head [=Vogelkop] and Huon Peninsulas—two substantially higher and more extensive montane regions in New Guinea). Our particular focus is the 'upland'

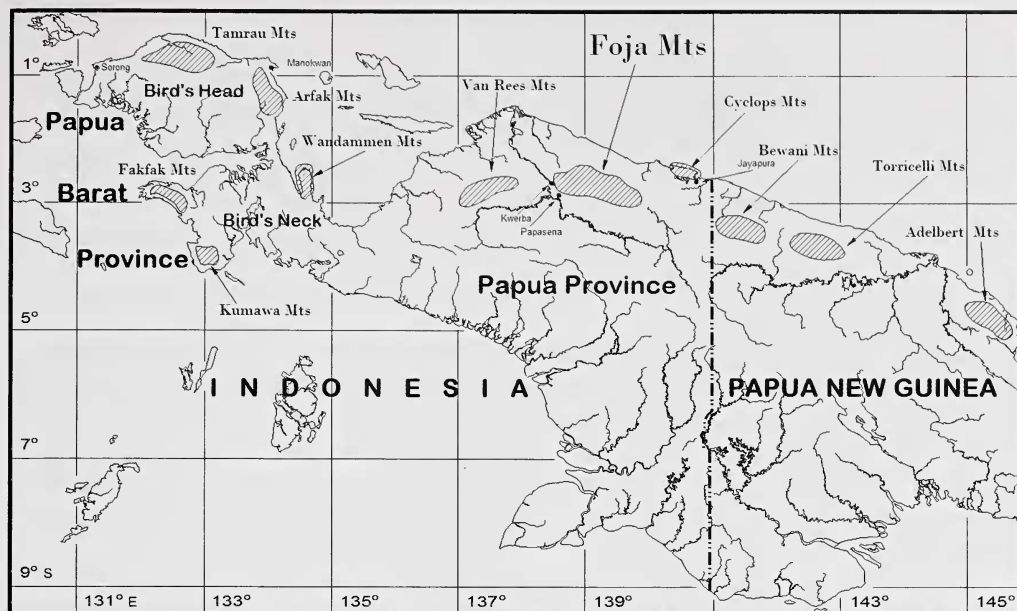


Figure 1. Locator map for the Foja Mountains and other outlying mountain ranges in central and western New Guinea. Note that the mountains of the Huon Peninsula lie off this map and are located c.100 km south-east of the Adelbert Mountains (at the far right of the map).

(>300 m elevation) and 'montane' (>1,000 m) birdlife of the Foja Mountains in the context of these isolated ranges of central New Guinea. Because of its small extent, lower height and incomplete survey, we omit the Van Rees Mountains from this discussion.

Following the taxonomic results of recent exploration of the Foja Mountains of western New Guinea (Beehler & Prawiradilaga 2010), here we summarise the distributional results of five surveys of these mountains—identified by Diamond (1985) as the least-known major outlying range on New Guinea. The initial ornithological reconnaissance field trips by Diamond in affiliation with the Worldwide Fund for Nature-Indonesia (Diamond 1982, 1985) were followed by a hiatus of 24 years, brought about by the logistical and political difficulties that Conservation International faced in mounting a formal biodiversity expedition into these very isolated mountains in Indonesian New Guinea.

These follow-on 'RAPs' (Rapid Assessments) organised and led by Conservation International (CI) in partnership with the Smithsonian Institution and the Indonesian Institute of Science were inspired by Diamond's discovery that the Foja Mountains were home to the 'lost' Golden-fronted Bowerbird *Amblyornis flavifrons*—a species described in 1896 by Lord Lionel Walter Rothschild from trade skins collected without geographic attribution (see Beehler & Prawiradilaga 2010).

An overflight by BMB in a single-engine aircraft in 1987 provided an overview of the western summit region of the Foja range, where a boggy opening at 1,652 m appeared to offer the best means of helicopter access to the interior uplands. Planning continued on and off for two decades, including additional overflights in 1994 and early 2005. During this period, CI established a field programme in the Mamberamo Basin and constructed a field station in Kwerba village, in the western foothills where the summit ridges lead down to the main flow of the Mamberamo River (Fig. 1).

Field work and study sites

1979 (11–18 October).—Accompanied by a Dani man named Wiwor, JMD was dropped by helicopter onto a gravel riverbank at an elevation of 600 m on the southern slope of the range, and observed birds at 600–1,400 m along a trail that Wiwor cleared.

1981 (30 January–13 February).—Accompanied by the Dani men Wiwor and Oba and by the botanist H. Makabory, JMD was transported by helicopter to a boggy clearing at 1,621 m and surveyed birds at 1,000–2,027 m along trails that Wiwor and Oba cleared. Diamond's landing site may be the same bog that subsequent CI expeditions visited, but coordinates differ sufficiently to make this assumption speculative (the field trip took place prior to the advent of GPS).

2005 (15 November–9 December).—The 14 scientists of the CI-RAP team arrived at Kwerba (73 m), which served as the expedition base. The hill forest team (with ornithologist NK) surveyed on foot from Kwerba to forest at 750 m, above the hill forest base at Hotice (700 m). The mountain team was ferried by helicopter to the Bog Camp (1,652 m) on 22 November and stayed until 7 December. The mountain team (with ornithologist BMB) operated from a single camp established at the Bog, but visited forests at 1,200–1,900 m (see Beehler 2006).

2007 (14–25 June).—The joint 60 Minutes / CI-science team (ornithologists BMB & TL) arrived at Papasena village base camp on 14 June and went by helicopter to the Bog Camp on 15 June, staying until 25 June. All field work was conducted within 2 km of the Bog Camp.

2008 (27 October–26 November).—The second CI-RAP Team arrived at Kwerba on 27 October. BMB led a foothills reconnaissance up the Ibem River to 273 m elevation on 29 October–3 November. The mountain team (with ornithologists NK, TL, ES, CM & M. White) was ferried by helicopter to the Bog Camp on 6 November. Operations from the Bog Camp continued until 26 November, with two satellite camps established at higher and lower elevations for short periods. Upper Camp (1,970 m) operated 12–18 November with the highest point being a broad forested summit at *c.*2,175 m. Lower Camp (1,250 m) was occupied 19–24 November (see Oliver *et al.* 2011). Birds were mist-netted at the western summit, above Upper Camp on 16 and 18 November 2008.

Foja Camp locations.—Papasena: 02°91.8'S, 138°54.8'E (48 m); Kwerba: 02°64.2'S, 138°40.9'E (73 m); Lower Camp: 02°59.2'S, 138°71.9'E (1,250 m); Bog Camp: 02°57.2'S, 138°71.7'E (1,652 m); Upper Camp 02°56.6'S, 138°69.2'E (1,970 m); Summit (mist-nets set, but no camp): 02°563'S, 138°68.0'E (2,175 m).

Forest environments.—The forests of the Foja Mountains are probably typical of the north coastal ranges of New Guinea. They lie on poorly-lithified deepwater siltstones that are unstable, and which in areas of relief show much evidence of land movement and forest disturbance. The rivers flowing from of the south side of the Foja range gouge broad rocky floodways with much exposed blackish siltstone. These siltstones, in turn, are underlain by igneous rocks found in the courses of interior riverbeds. The foothill forests are tall, festooned with vines, with many buttressed species, including *Octomeles sumatrana*, *Intsia* sp., *Sloanea* sp., *Pometia pinnata*, various figs, *Caryota* palms and many pandans, palms and canes. Van Heist *et al.* (2010) provided a quantitative description of the low foothill forests, noting many poorly known or still undescribed tree species. Montane forests are heavily disturbed because of the instability of the parent rock, and exhibit mossing as low as 1,200 m, evidence of persistent mist year-round. The presence of stands of the casuarina *Gymnostoma* sp., and the super-emergent *Araucaria cunninghamii* at middle elevations are visible from the air. Forests above 1,500 m are very heavily mossed, but quite well developed on plateau

areas, with tall, large-girthed canopy trees. During JMD's field work, H. Makabory noted that dominant trees at the 1981 bog camp included species of *Calophyllum*, *Nothofagus*, *Syzygium* and *Podocarpus neriifolius* and *Castanopsis accuminatissima*.

Climate seasonality.—The Foja Mountains lie in a zone of seasonal rainfall typical for most of New Guinea—with a dry season in June–August and peak wet season at the end of the calendar year. Rainfall accumulations are apparently moderate at low elevations and higher above 1,000 m, as evidenced by vegetation and mossing. Persistent rains flooded the upland Bog in November 2008.

Methods

We follow the taxonomy and sequence of Beehler *et al.* (1986) and for English names follow the IOC world bird list (<http://www.worldbirdnames.org/names.html>). Birds were surveyed by sight, sound and mist-net. In a few instances, hunters brought in birds that they had shot with bow & arrow (a cassowary, two forest rails, a woodcock and a mouse warbler). Networks of walking tracks were cut by the team for making observations at each camp. These were walked at various hours of the day and night. Mist-nets were operated day and night. Small collections of study skins and whole and partial anatomical specimens (2005, 2008) were made and currently reside at the Museum Zoologicum Bogoriense (now at Cibinong, Indonesia). In addition, sound and video recordings are archived at the Macaulay Library, Cornell Lab of Ornithology, Ithaca, NY.

Results

The five field trips confirmed 237 species of birds in the Foja Mountains, with an additional five species requiring confirmation (see Appendix). A total of 675 individuals of 59 species was mist-netted. Five species were recorded only by mist-netting, highlighting the importance of this tool. First sound-recordings of *Amblyornis flavifrons* and Bronze Parotia *Parotia berlepschi* were made. Video recordings were made of foraging behaviour of Dwarf Cassowary *Casuarius bennetti* at a bower of *Amblyornis flavifrons*; pair behaviour of Salvadori's Teal *Salvadorina waigiuiensis*; display behaviour of *A. flavifrons* and Black Sicklebill *Epimachus fastosus*; and courtship behaviour of *P. berlepschi*. Bird sounds of >30 species have been archived at Cornell, and 260 specimens of 59 species were collected and now reside in the bird collection of the Natural History Museum at Cibinong.

Selected species accounts.—A compilation of all species observed in the Foja Mountains and their max. and min. observed elevational occurrence appears in the Appendix. Species featured below include those for which we provide novel distributional, ecological or behavioural data.

SALVADORI'S TEAL *Salvadorina waigiuiensis*

Observed at the Bog Camp in a small watered channel within the bog in 2005, and a pair was filmed foraging and displaying on open water when the bog flooded in November 2008 (Macaulay Library Video catalog nos. 57905–914).

ORNATE FRUIT DOVE *Ptilinopus ornatus*

One trapped at the Bog Camp in June 2007. JMD recorded it above 1,621 m, encountering two birds nest-building in February 1981.

IMPERIAL PIGEON *Ducula cf. chalconota* / sp. nov.

A novel imperial pigeon was photographed in 2008 that is evidently a geographical representative of the Shining Imperial Pigeon *Ducula chalconota* lineage, but exhibits several plumage characters that distinguish it from *D. chalconota*. It will be described in a separate publication. *D. chalconota* has been recorded from the Wandammen Mountains to the west, but not in the Cyclops or Bewani / Torricelli Mountains to the east.

DUSKY LORY *Pseudeos fuscata*

During the 1981 field trip, each morning around 06.30 h, JMD observed several vocal groups of 2–10 birds flying over camp southwards, at a height of 5–100 m. Each evening, at c.18.30 h (after sunset), groups flew back over camp towards the north. This exemplifies this species' remarkable long-distance foraging movements that remain poorly documented and unexplained. The phenomenon certainly merits additional attention. It is analogous to the large-scale movement of flocks of Papuan Mountain Pigeon *Gymnophaps albertisi*.

MADARASZ'S TIGER PARROT *Psittacella madaraszii*

Observed on three occasions by NK. This is the first record in the north coastal ranges of a species known from the uplands of the Huon Peninsula and the Central Range. Its sister form, Modest Tiger Parrot *P. modesta* is recorded from the uplands of the Bird's Head to the west.

RUFOUS-THROATED BRONZE CUCKOO *Chrysococcyx ruficollis*

Heard repeatedly and sound-recorded in 2005 at the Bog Camp (BMB) and also by NK in 2008. Also known from the Wandammen and Arfak Mountains (Beehler *et al.* 1986).

?MOUNTAIN KINGFISHER *Halcyon megarhyncha*

ES & NK heard vocalisations they ascribed to this species at the Bog Camp in 2008 but were unable to locate the bird. Because of possible confusion with *Cacomantis* cuckoos, this species requires confirmation.

?YELLOW-EYED CUCKOOSHRIKE *Coracina lineata*

In 2005, NK observed in the Foja foothills a cuckooshrike with a dark face and crisp ventral barring, which should be looked for by future field workers at fruiting fig trees below 1,200 m elevation. This species has a puzzling distribution, being patchy in the Central Range and is present only on some outlying ranges.

MOUNTAIN MOUSE WARBLER *Crateroscelis robusta*

With regard to the newly named population of this species from the Foja Mountains (Beehler & Prawiradilaga 2010), JMD was struck by the white throat of the Foja male, contrasting so strikingly with the rest of the bird's plumage that it seemed to 'shine' out in the dark understorey. The same was true of the throat of the Foja population of three other ground or understorey species, the white-throated Lesser Ground Robin *Amalocichla incerta* and the white-cheeked Spotted Jewel-babbler *Ptilorrhoa leucosticta* and Ashy Robin *Poecilodryas albispectularis*. It is worth considering whether there has been some signal convergence in these ecologically similar species that occur in the same understorey microhabitat.

?BICOLOURED MOUSE WARBLER *Crateroscelis nigrorufa*

NK heard a distinct mouse-warbler song and 'pished' the bird to close range, observing its uniformly rufous underparts. Apparently, the same bird was observed on a subsequent day

by M. White. Future field workers should look for this species in a narrow elevational band at middle elevations near the lower boundary of the elevational range of *C. robusta*.

?GREY GERYGONE *Gerygone cinerea*

JMD made one observation on 6 February 1981, an individual in the canopy of the forest in a bird wave at 1,258 m. JMD noted the very small size, short tail (e.g., shorter than in *Sericornis*), grey dorsal and clean white ventral plumage. As there were no additional sightings by the other field teams, this requires confirmation.

SCRUBWRENS *Sericornis* spp.

In the Foja Mountains, Perplexing Scrubwren *S. virgatus* and Large Scrubwren *S. nouhuysi* meet parapatrically at c.1,400 m, below which elevation the former species was abundant and above which the latter was common. Their songs are similar to each other and to that of Green-backed Gerygone *Gerygone chloronata*, in being rapid, high-pitched, tinkling runs of notes up and down like a sine wave, but the song of *S. virgatus* has more notes, is more run together, conforms more closely to a sine wave, and is less tinkling and less high-pitched than is that of *S. nouhuysi*.

Grey-green Scrubwren *S. arfakianus* was abundant up to 1,425 m and Buff-faced Scrubwren *S. perspicillatus* common down to 1,367 m, with minimal altitudinal overlap. *S. arfakianus* was the smallest of the Foja *Sericornis* species, almost always in groups of 2–3, with a squeaky call note and short fast energetic squeaky song. *S. perspicillatus* often called a distinctive dry *chip* and frequently gave a rapid ascending series of small scolding notes. JMD observed Pale-billed Scrubwren *S. spilodera* at 758 m and 10 m above ground. The species was also observed by the team in 2008 at 1,250 m (see Appendix).

SMOKY ROBIN *Peneothello cryptoleuca*

A nest with egg was located near the western summit at 2,170 m on 18 November 2008 by CM. The cup-shaped nest was sited c.2.5 m above ground in the fork of a small (7-cm diameter) tree. The cup was lined with ferns and woven plant fibres. The outside was covered in moss. The single egg was pale brown with a wreath of darker reddish-brown blotching on the broad end.

?VOGELKOP WHISTLER *Pachycephala meyeri*

Observed at 1,600 m on 4 February 1981 by JMD; a pair foraged in forest vegetation at 3.5–18.0 m, and approached to within 4 m. Diamond (1985) noted it from below (upperparts not seen well) as a small-sized *Pachycephala*, with a distinctive song different from that of congenics, with ventral plumage corresponding to specimens (subsequently examined) of *P. meyeri*. Both individuals were similar in appearance. Because this sexually monomorphic, poorly known species has otherwise been recorded only from the Arfak and Tamrau Mountains of the Bird's Head, this record requires confirmation.

BLACK PITOHI *Pitohui nigrescens*

In 1979 and 1981 JMD reported that the species was almost silent and unobtrusive, but fairly common at 1,236–1,900 m. Fifteen were mist-netted in 2005 and 2008. In this dichromatic species, the majority (presumed males) were dull black (slate or charcoal, not glossy), while the minority (presumed females and immatures) were dull medium brown, paler ventrally. The brown form was superficially similar to female *Amblyornis flavifrons* but differed in being greyer, less olive and slightly smaller, as well as differing in its bill shape and behaviour. The bill was hooked, the rictal bristles pronounced and the body chunky.

It perched stolidly upright at heights from the understorey to 12 m, moved sluggishly by short hops, and foraged by hover-gleaning. Usually the species was solitary, but JMD once saw a black individual feeding a begging brown individual, and twice saw the species in mixed-species flocks.

SPOTTED BERRYPECKER *Rhamphocharis crassirostris*

This rare and little-known species was observed in 1981, 2005 and 2008 at middle elevations. JMD observed a group of three at 1,688 m, foraging at heights of 9–27 m, feeding in a flowering or fruiting tree. The three were in different plumages. One, a presumed female, had heavy pale spotting below. A second (female or immature male?) had a brown head, sparse spots or mottling on whitish underparts, and the undertail white with a dark terminal band. The third, presumed male, resembled a male Fan-tailed Berrypecker *Melanocharis versteri* in its clear grey underparts and dark upperparts with some sheen, but had a long bill and dark medium–short tail. This is the only time these three distinct plumages were observed in one group. Their vocalisations consisted of a fast, sibilant, ‘sucked-in’, energetic, short outburst reminiscent of Red-collared Myzomela *Myzomela rosenbergii*, plus sibilant *ts-ts-ts* notes.

OLIVE STRAIGHTBILL *Timeliopsis fulvigula*

JMD recorded the species at heights of 2.5 m and 15 m in the vegetation. Movements were rapid hops of just a few centimetres. Foraging consisted of probing moss, gleaning and stretching forwards to glean. Vocalisations were *ee-ee-ee* sounds like a baby bird, slightly upslurred and with a somewhat rough quality, given at a rate of three per second.

GOLDEN-FRONTED BOWERBIRD *Amblyornis flavifrons*

Common in the mid-montane forest interior, with display bowers sited on rounded ridge-crests (Beehler & Prawiradilaga 2010: 283–284). This and the following species are the Foja Mountain Range’s biogeographically most significant endemics.

BRONZE PAROTIA *Parotia berlepschi*

Details of the morphology, plumage, vocalisations, behaviour and systematics of this form will be treated in a separate publication. Video and audio files as well as many still images of male and female-plumaged birds were collected and all of this material has been archived at the Cornell Lab.

Discussion

Our discussion focuses mainly on the birdlife of the Foja Mountains and adjacent ranges—geographic distribution, elevational patterns of species-groups, seasonality and future research. Many bird species endemic to New Guinea are affiliated with mountain systems. These can be classified as ‘upland’, which we consider here to be mountain-associated species mainly distributed above 300 m, and ‘montane’, which we define as mountain-restricted species mainly or exclusively found above 1,000 m elevation. Any mountain range, such as the Foja Mountains, will be inhabited by (a) lowland species that also occur in the mountain forests to some elevation; (b) upland species that are generally absent from the surrounding lowlands, but which inhabit the lower (and sometimes upper) elevations of the range; and (c) montane species, which are mountain-restricted and are only found above 1,000 m. The Appendix classifies the birds of the Foja Mountains into these three categories and forms the database upon which the following discussions are based.

TABLE 1
Montane species / species-groups that occur mainly > 1,000 m, and which are found in at least one of the following ranges:
Wandammen, Foja, Cyclops, and Bewani / Torricelli Ranges

Genus	Bird's Head	Wandammen	Foja	Cyclops	Bewani / Torricelli	Adelbert	Huon	Central Range
<i>Rallidula</i>	<i>leucospila</i>	<i>leucospila</i>	<i>mayri</i>	<i>mayri</i>	<i>mayri</i>	<i>forbesi</i>	<i>forbesi</i>	<i>forbesi</i>
<i>Scolopax</i>	<i>saturata</i>	-	<i>saturata</i>	-	-	-	<i>saturata</i>	<i>saturata</i>
<i>Gallinulumba</i>	<i>beccarii</i>	-	<i>beccarii</i>	<i>beccarii</i>	<i>beccarii</i>	-	<i>beccarii</i>	<i>beccarii</i>
<i>Ducula</i>	<i>chalconota</i>	<i>chalconota</i>	new taxon	-	-	-	<i>chalconota</i>	<i>chalconota</i>
<i>Neopsittacus</i>	<i>musschenbroekii</i>	-	<i>musschenbroekii</i>	-	-	-	<i>musschenbroekii</i>	<i>musschenbroekii</i>
<i>Micropsitta</i>	<i>bruijnii</i>	<i>bruijnii</i>	<i>bruijnii</i>	<i>bruijnii</i>	<i>bruijnii</i>	<i>bruijnii</i>	<i>bruijnii</i>	<i>bruijnii</i>
<i>Psittacula</i>	<i>modesta</i>	-	<i>madaraszi</i>	-	-	-	<i>madaraszi</i>	<i>modesta + madaraszi</i>
<i>Chrysococcyx</i>	<i>ruficollis</i>	<i>ruficollis</i>	<i>ruficollis</i>	-	-	-	<i>ruficollis</i>	<i>ruficollis</i>
<i>Aegothales</i>	<i>insignis</i>	<i>insignis</i>	<i>insignis</i>	-	<i>insignis</i>	<i>insignis</i>	<i>insignis</i>	<i>insignis</i>
<i>Aegothales</i>	<i>albertisi</i>	<i>albertisi</i>	<i>albertisi</i>	-	-	-	<i>albertisi</i>	<i>albertisi + archboldi</i>
<i>Halcyon</i>	-	-	?	-	-	?	<i>megarhyrcha</i>	<i>megarhyrcha</i>
<i>Coracina</i>	<i>montana</i>	<i>montana</i>	<i>montana</i>	<i>montana</i>	<i>montana</i>	<i>montana</i>	<i>montana</i>	<i>montana</i>
<i>Ptilorrhoa</i>	<i>leucosticta</i>	<i>leucosticta</i>	<i>leucosticta</i>	<i>leucosticta</i>	<i>leucosticta</i>	-	<i>leucosticta</i>	<i>leucosticta</i>
<i>Phylloscopus</i>	<i>poliocephalus</i>	<i>poliocephalus</i>	<i>poliocephalus</i>	<i>poliocephalus</i>	<i>poliocephalus</i>	<i>poliocephalus</i>	<i>poliocephalus</i>	<i>poliocephalus</i>
<i>Craterocelis</i>	<i>robusta</i>	<i>robusta</i>	<i>robusta</i>	<i>robusta</i>	<i>robusta</i>	-	<i>robusta</i>	<i>robusta</i>
<i>Sericornis</i>	<i>rufescens</i>	-	<i>perspicillatus</i>	-	<i>perspicillatus</i>	<i>perspicillatus</i>	<i>perspicillatus</i>	<i>perspicillatus</i>
<i>Sericornis</i>	-	-	<i>papuensis</i>	-	-	-	<i>papuensis</i>	<i>papuensis</i>
<i>Sericornis</i>	<i>nouhuysi</i>	-	<i>nouhuysi</i>	-	-	<i>nouhuysi</i>	<i>nouhuysi</i>	<i>nouhuysi</i>
<i>Sericornis</i>	<i>arfakianus</i>	<i>arfakianus</i>	<i>arfakianus</i>	<i>arfakianus</i>	<i>arfakianus</i>	<i>arfakianus</i>	<i>arfakianus</i>	<i>arfakianus</i>
<i>Rhipidura</i>	<i>brachyrhyncha</i>	-	<i>brachyrhyncha</i>	-	-	-	<i>brachyrhyncha</i>	<i>brachyrhyncha</i>
<i>Rhipidura</i>	<i>atra</i>	<i>atra</i>	<i>atra</i>	<i>atra</i>	<i>atra</i>	<i>atra</i>	<i>atra</i>	<i>atra</i>
<i>Rhipidura</i>	<i>albolimbata</i>	<i>albolimbata</i>	<i>albolimbata</i>	<i>albolimbata</i>	<i>albolimbata</i>	-	<i>albolimbata</i>	<i>albolimbata</i>
<i>Monarcha</i>	<i>axillaris</i>	<i>axillaris</i>	<i>axillaris</i>	<i>axillaris</i>	<i>axillaris</i>	<i>axillaris</i>	<i>axillaris</i>	<i>axillaris</i>
<i>Machærirhynchus</i>	<i>nigripictus</i>	<i>nigripictus</i>	<i>nigripictus</i>	-	-	<i>nigripictus</i>	<i>nigripictus</i>	<i>nigripictus</i>

Genus	Bird's Head	Wandammen	Toja	Cyclops	Bewani / Torricelli	Adelbert	Huon	Central Range
<i>Microeca</i>	<i>papuana</i>	<i>papuana</i>	<i>papuana</i>	-	<i>papuana</i>	-	<i>papuana</i>	<i>papuana</i>
<i>Eugerygone</i>	<i>rubra</i>	-	<i>rubra</i>	-	-	-	<i>rubra</i>	<i>rubra</i>
<i>Poecilodryas</i>	<i>albispecularis</i>	-	<i>albispecularis</i>	-	-	<i>albispecularis</i>	<i>albispecularis</i>	<i>albispecularis</i>
<i>Amalocichla</i>	<i>incerta</i>	<i>incerta</i>	<i>incerta</i>	-	<i>incerta</i>	-	<i>incerta</i>	<i>incerta</i>
<i>Pentothello</i>	<i>cryptoleuca</i>	-	<i>cryptoleuca</i>	-	-	-	-	<i>cryptoleuca</i>
<i>Pentothello</i>	<i>cyaneus</i>	<i>cyaneus</i>	<i>cyaneus</i>	<i>cyaneus</i>	<i>cyaneus</i>	<i>cyaneus</i>	<i>cyaneus</i>	<i>cyaneus</i>
<i>Pachycaere</i>	<i>flavogriseum</i>	<i>flavogriseum</i>	<i>flavogriseum</i>	-	<i>flavogriseum</i>	-	<i>flavogriseum</i>	<i>flavogriseum</i>
<i>Pachycephala</i>	<i>schlegelii</i>	<i>schlegelii</i>	<i>schlegelii</i>	<i>schlegelii</i>	<i>schlegelii</i>	-	<i>schlegelii</i>	<i>schlegelii</i>
<i>Pachycephala</i>	<i>rufinucha</i>	<i>rufinucha</i>	<i>rufinucha</i>	-	<i>rufinucha</i>	<i>rufinucha</i>	<i>rufinucha</i>	<i>rufinucha</i>
<i>Pitohui</i>	<i>nigrescens</i>	<i>nigrescens</i>	<i>nigrescens</i>	-	-	-	<i>nigrescens</i>	<i>nigrescens</i>
<i>Melanocharis</i>	<i>versteri</i>	<i>versteri</i>	<i>versteri</i>	<i>versteri</i>	<i>versteri</i>	-	<i>versteri</i>	<i>versteri</i>
<i>Rhamphocharis</i>	<i>crassirostris</i>	-	<i>crassirostris</i>	-	-	-	<i>crassirostris</i>	<i>crassirostris</i>
<i>Oreocharis</i>	<i>arfaki</i>	-	<i>arfaki</i>	-	<i>arfaki</i>	-	<i>arfaki</i>	<i>arfaki</i>
<i>Zosterops</i>	<i>fuscicapillus</i>	<i>fuscicapillus</i>	<i>fuscicapillus</i>	<i>fuscicapillus</i>	<i>fuscicapillus</i>	-	<i>fuscicapillus</i>	<i>fuscicapillus</i>
<i>Timeliopsis</i>	<i>fulvifigula</i>	-	<i>fulvifigula</i>	-	<i>fulvifigula</i>	-	<i>fulvifigula</i>	<i>fulvifigula</i>
<i>Myzomela</i>	<i>adolphinae</i>	-	-	-	<i>adolphinae</i>	-	<i>adolphinae</i>	<i>adolphinae</i>
<i>Myzomela</i>	<i>rosenbergii</i>	<i>rosenbergii</i>	<i>rosenbergii</i>	<i>rosenbergii</i>	<i>rosenbergii</i>	<i>rosenbergii</i>	<i>rosenbergii</i>	<i>rosenbergii</i>
<i>Melidectes</i>	<i>ochromelas</i>	<i>ochromelas</i>	<i>ochromelas</i>	-	-	-	<i>ochromelas</i>	<i>ochromelas</i>
<i>Ptiloprora</i>	-	<i>perstriata</i>	<i>mayri</i>	<i>mayri</i>	<i>mayri</i>	-	<i>guisei</i>	<i>guisei + perstriata</i>
<i>Melipotes</i>	<i>gymnops</i>	<i>gymnops</i>	<i>carolae</i>	<i>fumigatus</i>	<i>fumigatus</i>	-	<i>ater</i>	<i>fumigatus</i>
<i>Amblyornis</i>	<i>inornatus</i>	<i>inornatus</i>	<i>flavifrons</i>	-	-	<i>macgregoriae</i>	<i>macgregoriae</i>	<i>macgregoriae</i>
<i>Lophorina</i>	<i>superba</i>	<i>superba</i>	-	-	-	<i>superba</i>	<i>superba</i>	<i>superba</i>
<i>Parotia</i>	<i>seflata</i>	<i>seflata</i>	<i>berlepschi</i>	taxon?	-	<i>wahnesi</i>	<i>wahnesi</i>	<i>laevesii + carolae</i>
<i>Drepanornis</i>	<i>albertisi</i>	<i>albertisi</i>	<i>albertisi</i>	-	-	-	<i>albertisi</i>	<i>albertisi</i>
<i>Epimachus</i>	<i>fastosus</i>	<i>fastosus</i>	<i>fastosus</i>	-	<i>fastosus</i>	-	-	<i>fastosus + meyeri</i>
number present	46	33	46	19	28	18	46	49

Distributional patterns.—Table 1 lists all 49 species of montane birds recorded either from the Foja (2,219 m), Wandammen (2,075 m), Cyclops (2,161 m), or Bewani / Torricelli Mountains (1,886 m). Max. elevations for each mountain range are extracted from Diamond (1985). Table 1 also shows whether these core ‘north coastal’ species also inhabit the other major mountain groups in New Guinea—from largest to smallest: Central Range (4,884 m), Huon uplands (4,122 m), Bird’s Head uplands (2,930 m) and Adelbert Range (1,600 m). The Foja range is the highest and most extensive of the central north coastal ranges, and supports all but two of the core species (Midget Myzomela *Myzomela adolphinae* and Superb Bird-of-Paradise *Lophorina superba*). It is interesting to note that two much higher and more extensive outlying ranges, those of the Huon Peninsula (the Finisterre / Saruwaged ranges) and Vogelkop Peninsula (the Arfak / Tamrau ranges), do not possess a larger share of this core north coastal avifauna (both support 46 species), despite being more species-rich overall. These two larger ranges are biogeographically distinct in several ways and also possess an array of additional montane species not found among the core north coastal ranges (such as a representative of the Belford’s Honeyeater *Melidectes belfordi* superspecies, a *Paradigalla*, an *Astrapia*, a *Lonchura*, etc.). The overall montane species total for the Huon is 72 species and for the Bird’s Head is 65 species.

Perhaps the most notable finding contained in Table 1 is that different species and species-groups exhibit seemingly random and unpredictable patterns of occurrence / absence. While it is difficult to know the underlying causes responsible for this unusual pattern, we hypothesise that the stochastic nature of mountain-to-mountain dispersal compounded with sporadic pulses of extinction of small upland populations probably have contributed to the emergent pattern. Perhaps the most extreme example of this is Papuan Scrubwren *Sericornis papuensis*, which occurs on the Foja, Huon and Central Range, but is absent from the Bird’s Head, Wandammen, Cyclops, Bewani / Torricelli and Adelbert ranges.

Elevational sequences.—The Foja avifauna (see Appendix) includes at least 22 species’ elevational sequences, in which closely related (congeneric) or ecologically similar species replace each other elevationally. Some of these sequences, especially ones involving sedentary territorial species, are sharp with little or no elevational overlap. Others, especially ones involving social non-territorial species that wander in search of flowering and fruiting trees, involve some overlap in altitude—as in the genera *Charmosyna*, *Melanocharis*, *Zosterops* and *Myzomela*.

Of these 22 sequences, six involve triplets of species: Little Bronze Cuckoo *Chrysococcyx minutillus* / White-eared Bronze Cuckoo *C. meyeri* / Rufous-throated Bronze Cuckoo *C. ruficollis*, Blue Jewel-babbler *Ptilorhoa caerulescens* / Chestnut-backed Jewel-babbler *P. castanonota* / Spotted Jewel-babbler *P. leucostica*, Pale-billed Scrubwren *Sericornis spilodera* / Grey-green Scrubwren *S. arfakianus* / Buff-faced Scrubwren *S. perspicillatus*, White-rumped Robin *Peneothello bimaculata* / Slaty Robin *P. cyanus* / Smoky Robin *P. cryptoleuca*, Black Berrypecker *Melanocharis nigra* / Lemon-breasted Berrypecker *M. longicauda* / Fan-tailed Berrypecker *M. versteri* and Black Myzomela *Myzomela nigrita* / Red Myzomela *M. cruentata* / Red-collared Myzomela *M. rosenbergii*.

The other 16 examples are pairs of species: Chestnut-shouldered Goshawk *Accipiter buergersi* / Meyer’s Goshawk *A. meyerianus*, Red-flanked Lorikeet *Charmosyna placentis* / Fairy Lorikeet *C. pulchella*, Buff-faced Pygmy Parrot *Micropsitta pusio* / Rose-breasted Pygmy Parrot *M. bruijnii*, Red-cheeked Parrot *Geoffroyus geoffroyi* / Blue-collared Parrot *G. simplex*, Black-tipped Cicadabird *Coracina schisticeps* / Black-bellied Cuckooshrike *C. montana*, Rusty Mouse Warbler *Crateroscelis murina* / Bicoloured Mouse Warbler *C. robusta*, Perplexing Scrubwren *Sericornis virgatus* / Large Scrubwren *S. nouhuysi*, Sooty Thicket Fantail *Rhipidura*

threnothorax / Black Fantail *R. atra*, Chestnut-bellied Fantail *R. hyperythra* / Friendly Fantail *R. albolimbata*, Yellow-breasted Boatbill *Machaerirhynchus flaviventer* / Black-breasted Boatbill *M. nigripectus*, Rusty Whistler *Pachycephala hyperythra* / Regent Whistler *P. schlegelii*, Variable Pitohui *Pitohui kirhocephalus* / Hooded Pitohui *P. dichrous*, Black-crowned White-eye *Zosterops atrifrons* / Capped White-eye *Z. fuscicapillus*, Mimic Honeyeater *Meliphaga analoga* / Hill-forest Honeyeater *M. orientalis*, Clicking Shieldbill *Peltops blainvillii* / Tinkling Shieldbill *P. montanus* and White-eared Catbird *Ailuroedus buccoides* / Black-eared Catbird *A. melanotis*. It is through this elevational sorting that the avifauna of the Foja Mountains achieves its substantial level of species-richness.

Seasonality.—We confine our discussion of seasonality to display activities of birds-of-paradise and bowerbirds. The data we have indicate a rather diffuse annual seasonality, with perhaps inter-annual variability related to multi-year El Niño / Southern Oscillation impacts on local rainfall. *Epimachus fastosus* was vocal and displaying in June 2007, but less active and moulting in November 2008. By contrast, *Parotia berlepschi* was displaying at its terrestrial court in December 2005, but not in June 2007 and infrequently in November 2008. A King Bird-of-Paradise *Cicinnurus magnificus* trapped at Lower Camp in November 2008 was moulting. *Amblyornis flavifrons* was actively displaying in February 1981 and November 2005, was moderately active in November 2008, but less active in June 2007. These observations indicate a display season that may extend from June to February, with a non-display period in the early half of the calendar year. In terms of rainfall, we found precipitation abundant in November–December (2005, 2008) and relatively low in June (2007). We suggest future field workers visit in September–October to encounter the most display activity and best weather. Nesting is presumably commonest at the end of the calendar year.

Conservation recommendation.—The entire expanse of the Foja massif—an area of c.300,000 ha, remains undeveloped (with no roads) and entirely unpopulated. This region is an important natural reserve for the 46 montane bird species living there, four of which (the imperial pigeon, honeyeater, bowerbird and bird-of-paradise) occur nowhere else on earth. This region, then, constitutes an immensely valuable resource for both nature conservation and ecosystem services provision. We recommend that decision-makers consider raising the level of national (and local) protection of the Foja Mountains region and work closely with local indigenous landowners to develop a long-term conservation and management plan for the northern verges of the Mamberamo Basin, for which the Foja uplands comprise an important sector. Intact upland forest blocks such as this one will become critical refuges for montane species under currently predicted regimes of climate change.

Future research.—Based on our experience in the Foja Mountains, we believe there is considerable scope for productive distributional field work to be conducted in New Guinea's outlying mountain ranges. The Wandammen and Cyclops Mountains have never undergone intensive mist-netting. Others would benefit from both mist-netting and sound-based surveys. Future field work in New Guinea's outlying ranges should include (1) a more thorough survey (with major mist-netting effort) in the Cyclops Mountains, (2) an extended effort using similar methods at the highest elevations of the Wandammen Mountains, and (3) additional survey effort in the highest forests of the small and isolated Kumawa and Fakfak Mountains. Any additional work in the Foja range should focus on visiting the eastern high summits (above 2,000 m) and the lower and middle elevations (800–1,200 m).

Correction.—The recent paper by Beehler & Prawiradilaga (2010) omitted three paratypes for *Pachycare flavogriseum lecrovae*. We here correctly list the entire series of

paratypes, all at the American Museum of Natural History, New York: AMNH 829697, 829698, 829699, 829700, 829701, 829702, 829703, 829704 and 829705.

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References:

- Beehler, B. M. 2006. The lost world. *Living Bird* summer 2006: 15–24.
- Beehler, B. M. & Prawiradilaga, D. M. 2010. New taxa and new records of birds from the north coastal ranges of New Guinea. *Bull. Brit. Orn. Cl.* 130: 277–285.
- Beehler, B. M., Pratt, T. K. & Zimmerman, D. A. 1986. *Birds of New Guinea*. Princeton Univ. Press.
- Beehler, B. M., Prawiradilaga, D. M., de Fretes, Y. & Kemp, N. 2007. A new species of smoky honeyeater (Meliphagidae: *Melipotus*) from western New Guinea. *Auk* 124: 1000–1009.
- Coates, B. J. 1985. *Birds of Papua New Guinea*, vol. 1. Dove Publications, Alderley.
- Coates, B. J. 1990. *Birds of Papua New Guinea*, vol. 2. Dove Publications, Alderley.
- Diamond, J. M. 1969. Preliminary results of an ornithological exploration of the north coastal range, New Guinea. *Amer. Mus. Novit.* 2362: 1–57.
- Diamond, J. M. 1972. *Avifauna of the Eastern Highlands of New Guinea*. Publ. Nuttall Orn. Club No. 12, Cambridge, MA.
- Diamond, J. M. 1982. Rediscovery of the Yellow-fronted Gardener Bowerbird. *Science* 216: 431–434.
- Diamond, J. M. 1985. New distributional records and taxa from the outlying mountain ranges of New Guinea. *Emu* 85: 65–91.
- García-Moreno, J., Arctander, P. & Fjeldså, J. 1999. A case of rapid diversification in the Neotropics: phylogenetic relationships among *Cranioleuca* spinetails (Aves, Furnariidae). *Mol. Phyl. & Evol.* 12: 273–281.
- Heist, M. van, Sheil, D., Rachman, I., Gusbager, P., Raweyai, C. O. & Yoteni, H. S. M. 2010. The forests and related vegetation of Kwerba, on the Foja foothills, Mamberamo, Papua (Indonesian New Guinea). *Blumea* 55: 153–161.
- Mayr, E. 1941. *List of New Guinea birds*. Amer. Mus. Nat. Hist., New York.
- Mayr, E. 1942. *Systematics and the origin of species*. Columbia Univ. Press, New York.
- Mayr, E. 1963. *Animal species and evolution*. Harvard Univ. Press, Cambridge, MA.
- Oliver, P., Krey, K., Mumpuni & Richards, S. 2011. A new species of bent-toed skink (*Cyrtodactylus*, Gekkonidae) from the North Papuan Mountains. *Zootaxa* 2930: 22–32.
- Pratt, T. K. 1982. Additions to the avifauna of the Adelbert Range, Papua New Guinea. *Emu* 82: 117–125.
- Rand, A. L. & Gilliard, E. T. 1967. *Handbook of New Guinea birds*. Weidenfeld & Nicolson, London.
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Appendix: species recorded in the Foja Mountains, New Guinea, during our field surveys Key: bold = upland form (>300 m elevation); bold with * = montane form (>1,000 m elevation)

Species list	Diamond 1979 (610–1,409 m)	Diamond 1981 (1,015–2,040 m)	RAP I – 2005 (73–1,770 m)	Beehler / Laman 2007 (1,652 m)	RAP II – 2008 (73–2,175 m)	Elev. records (metres)
Northern Cassowary <i>Casuarius unappendiculatus</i>			2	1	2	73–375
Dwarf Cassowary <i>Casuarius bennetti</i>	2	2	2	1	2	610–1,829
Pacific Baza <i>Aviceda subcristata</i>			1			73
Long-tailed Honey Buzzard <i>Henicopernis longicauda</i>	1	1	1	2	1	73–1,652
Brahminy Kite <i>Haliastur indus</i>			2			73
Grey Goshawk <i>Accipiter novaehollandiae</i>			1			73
Grey-headed Goshawk <i>Accipiter poliocephalus</i>			1			200–1,652
Collared Sparrowhawk <i>Accipiter cirrhocephalus</i>			1	2		1,652
Meyer's Goshawk <i>Accipiter meyerianus</i>		1		1	1	1,622–1,652
Chestnut-shouldered Goshawk <i>Accipiter buergersi</i>	1					884–1,198
Papuan Eagle <i>Harpyopsis novaeguineae</i>	1	1	1	1	1	854–1,675
Little Eagle <i>Hieraetus morphnoides</i>			1	1		1,652
Brown Falcon <i>Falco berigora</i>		1				1,627
Raja Shelduck <i>Tadorna radjah</i>				1		73
Salvadori's Teal <i>Salvadorina waigiensis</i>			1		1	1,652
New Guinea Megapode <i>Megapodius decollatus</i>			1			73
Collared Brushturkey <i>Talegalla jobiensis</i>	2		3		2	73–1,250
Wattled Brushturkey <i>Aepyodius arfakianus</i>		1	1		2	1,677–1,835
Mayr's Forest Rail <i>Rallidula mayri</i>*	1	2	3	2	2	1,198–1,680
Javan Woodcock <i>Scolopax saturata</i>*		1	2	3	1	1,652–1,701
<i>Gallinago</i> sp.	1	2	1		1	1,637
Common Sandpiper <i>Actitis hypoleucos</i>			1			100–271
Brown Cuckoo-Dove <i>Macropygia amboinensis</i>	3	2	2		2	73–1,668
Black-billed Cuckoo-Dove <i>Macropygia nigrirostris</i>	2	3	4	4	2	73–1,912
Great Cuckoo-Dove <i>Reinwardtoena reinwardtii</i>	1		3			73–1,652
Stephan's Emerald Dove <i>Chalcophaps stephani</i>			1			200
Cinnamon Ground Dove <i>Gallilolumba rufigula</i>	2		2			375–1,055
Bronze Ground Dove <i>Gallilolumba beccarii</i>*		2	2	1	1	1,381–1,848
Pheasant Pigeon <i>Otidiphaps nobilis</i>	2	1	4		1	651–1,670
Victoria Crowned Pigeon <i>Goura victoria</i>			2			73–375
Wompoo Fruit Dove <i>Ptilinopus magnificus</i>	2		3			73–918
Pink-spotted Fruit Dove <i>Ptilinopus perlatus</i>			3			73–100
Ornate Fruit Dove <i>Ptilinopus ornatus</i>		2	2	1	1	1,637–1,808
Superb Fruit Dove <i>Ptilinopus superbus</i>	3	1				651–1,646
Beautiful Fruit Dove <i>Ptilinopus pulchellus</i>	2		4			73–1,113
White-bibbed Fruit Dove <i>Ptilinopus rivoli</i>	3	3	3	3	3	1,067–1,951
Claret-breasted Fruit Dove <i>Ptilinopus viridis</i>	3	1	1		1	73–1,500
Orange-bellied Fruit Dove <i>Ptilinopus iozonus</i>			2			73–100
imperial pigeon <i>Ducula</i> sp. nov?*					1	1,450–1,700

Species list	Diamond 1979 (610–1,409 m)	Diamond 1981 (1,015–2,040 m)	RAP I – 2005 (73–1,770 m)	Beehler / Laman 2007 (1,652 m)	RAP II – 2008 (73–2,175 m)	Elev. records (metres)
Purple-tailed Imperial Pigeon <i>Ducula rufigaster</i>			2			73
Pinon Imperial Pigeon <i>Ducula pinon</i>			3			73–100
Zoe Imperial Pigeon <i>Ducula zoeae</i>	2	1	4			73–1,092
Papuan Mountain Pigeon <i>Gymnophaps albertisii</i>	1	3	1		2	610–2,040
Brown Lory <i>Chalcopsitta duivenbodei</i>			4			73–250
Dusky Lory <i>Pseudeos fuscata</i>		2	3	3	1	73–1,652
Coconut Lorikeet <i>Trichoglossus haematodus</i>			4			73–271
Black-capped Lory <i>Lorius lory</i>	2		4			73–732
Red-flanked Lorikeet <i>Charmosyna placensis</i>					1	73–271
Fairy Lorikeet <i>Charmosyna pulchella</i>	3	3	4	4	4	610–1,912
Josephine's Lorikeet <i>Charmosyna josefinae</i>	1	1	1	1	1	771–1,637
Yellow-billed Lorikeet <i>Neopsittacus musschenbroekii</i>*		3	2	3	2	1,149–2,040
Palm Cockatoo <i>Probosciger aterrimus</i>			1			73–271
Sulphur-crested Cockatoo <i>Cacatua galerita</i>	2	1	2	1		73–1,235
Buff-faced Pygmy Parrot <i>Micropsitta pusio</i>			2			73
Rose-breasted Pygmy Parrot <i>Micropsitta bruijnii</i>*	3	3	2	2	3	692–1,851
Orange-breasted Fig Parrot <i>Cyclopsitta guihelmitertii</i>					1	73
Yellow-cheeked Fig Parrot <i>Psittaculirostris salvadorii</i>			1			73–111
Madarasz's Tiger Parrot <i>Psittacella madaraszii</i>*					1	1,652–1,921
Red-cheeked Parrot <i>Geoffroyus geoffroyi</i>			4			73–271
Blue-collared Parrot <i>Geoffroyus simplex</i>	2	2	2	2	1	1,047–1,921
Eclectus Parrot <i>Eclectus roratus</i>			4			73–271
Pesquet's Parrot <i>Psittirichas fulgidus</i>	2	1	2	1	1	73–1,637
Papuan King Parrot <i>Alisterus chloropterus</i>	2	2	1			1,047–1,677
Brush Cuckoo <i>Cacomantis variolosus</i>	2		3		2	884–1,220
Chestnut-breasted Cuckoo <i>Cacomantis castaneiventris</i>	3	2	3	2	1	610–1,756
Little Bronze Cuckoo <i>Chrysococcyx minutillus</i>			1			73
White-eared Bronze Cuckoo <i>Chrysococcyx meyeri</i>	3	1	1			927–1,238
Rufous-throated Bronze Cuckoo <i>Chrysococcyx ruficollis</i>*			3	3	1	1,652
White-crowned Cuckoo <i>Caliechthrus leucolophus</i>			2			73–150
Dwarf Koel <i>Microdynamis parva</i>	2		2			73–1,047
Asian Koel <i>Eudynamis scolopacea</i>	2		2			73–1,052
Ivory-billed Coucal <i>Centropus menbeki</i>	1		3			73–610
Black-billed Coucal <i>Centropus bernsteini</i>			1			73
Greater Sooty Owl <i>Tyto tenebricosa</i>		1	1	1	1	1,637–1,652
Rufous Boobook <i>Ninox rufa</i>			1			73
Jungle Boobook <i>Ninox theomacha</i>		1	4		1	73–1,637
Marbled Frogmouth <i>Podargus ocellatus</i>			2		1	73
Papuan Frogmouth <i>Podargus papuensis</i>			1			73
Feline Owlet-Nightjar <i>Aegotheles insignis</i>*			2	2	2	1,652
Mountain Owlet-Nightjar <i>Aegotheles albertisi</i>*			3	2	1	1,652
Large-tailed Nightjar <i>Caprimulgus macrurus</i>					1	110

Species list	Diamond 1979 (610–1,409 m)	Diamond 1981 (1,015–2,040 m)	RAP I – 2005 (73–1,770 m)	Beehler / Laman 2007 (1,652 m)	RAP II – 2008 (73–2,175 m)	Elev. records (metres)
Papuan Nightjar <i>Eurostopodus papuensis</i>			1			750
Moustached Treeswift <i>Hemiprocne mystacea</i>	1	1	2			73–1,637
Uniform Swiftlet <i>Collocalia vanikorensis</i>	1?		4			73–
Mountain Swiftlet <i>Collocalia hirundinacea</i>		3	2	2		–1,652
Glossy Swiftlet <i>Collocalia esculenta</i>	2	1	1		1	610–1,698
Papuan Spine-tailed Swift <i>Mearnsia noveaguineae</i>			2			73–271
Galatea Paradise Kingfisher <i>Tanysiptera galatea</i>			2		1	73–111
Hook-billed Kingfisher <i>Melidora macrorrhina</i>	1		3			73–610
Shovel-billed Kookaburra <i>Clytoceyx rex</i>			2			73–100
Rufous-bellied Kookaburra <i>Dacelo gaudichaud</i>	2		2			73–793
Blue-black Kingfisher <i>Halcyon nigrocyanea</i>			1			80
Yellow-billed Kingfisher <i>Halcyon torotoro</i>	1		3			73–869
Chameleon Dwarf Kingfisher <i>Ceyx lepidus</i>	2		3			73–819
Azure Kingfisher <i>Alcedo azurea</i>					1	111
Blyth's Hornbill <i>Rhyticeros plicatus</i>	2	1	4	1	1	73–1,200
Red-bellied Pitta <i>Pitta erythrogaster</i>	2		2			651–793
Hooded Pitta <i>Pitta sordida</i>			1			73
Pacific Swallow <i>Hirundo tahitica</i>	1		1			610
Grey Wagtail <i>Motacilla cinerea</i>	1	2	2		1	111–1,637
White-bellied Cuckooshrike <i>Coracina papuensis</i>			1			111
Stout-billed Cuckooshrike <i>Coracina caeruleogrisea</i>	1	1	1		1	111–1,384
Boyer's Cuckooshrike <i>Coracina boyeri</i>			2			73–111
Black-shouldered Cicadabird <i>Coracina incerta</i>	3					866–1,198
Black-tipped Cicadabird <i>Coracina schisticeps</i>	3		1			73–1,113
New Guinea Cuckooshrike <i>Coracina melaena</i>	2		2			111–924
Black-bellied Cuckooshrike <i>Coracina montana</i>*	2	2	2	2		1,171–1,652
Golden Cuckooshrike <i>Campochaera sloetii</i>	2		1		1	73–927
Black-browed Triller <i>Lalage atrovirens</i>			3		2	73–111
Scaly Thrush <i>Zoothera dauma</i>	1					625
Chestnut-backed Jewel-babbler <i>Ptilorrhoa castanonota</i>	3				1	610–1,171
Spotted Jewel-babbler <i>Ptilorrhoa leucosticta</i>*		3	3	3	3	1,205–1,860
Blue Jewel-babbler <i>Ptilorrhoa caerulescens</i>			2			73–750
Papuan Babbler <i>Pomatostomus isidorei</i>	1		2			111–651
Island Leaf Warbler <i>Phylloscopus poliocephalus</i>*	4	3	1		1	951–1,409
Emperor Fairywren <i>Malurus cyanocephalus</i>			1			73
White-shouldered Fairywren <i>Malurus alboscapulatus</i>	1		1			111–869
Broad-billed Fairywren <i>Malurus grayi</i>	2		1			866–1,067
Wallace's Fairywren <i>Sipodotus wallacii</i>			1			850
Rusty Mouse Warbler <i>Crateroscelis murina</i>	4	2	4		2	73–1,418
Mountain Mouse Warbler <i>Crateroscelis robusta</i>*		4	4	4	3	1,363–2,037
Pale-billed Scrubwren <i>Sericornis spilodera</i>	1				1	758–1,250
Grey-green Scrubwren <i>Sericornis arfakianus</i>*	2	4			1	1,113–1,433

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Buff-faced Scrubwren <i>Sericornis perspicillatus</i> *		3	3	2	3	1,375–1,912
Large Scrubwren <i>Sericornis nouhuysi</i> *		3	3	4	2	1,442–1,991
Tropical Scrubwren <i>Sericornis beccarii</i> / Perplexing Scrubwren <i>S. virgatus</i>	4	3	2		1	610–1,390
Papuan Scrubwren <i>Sericornis papuensis</i> *		4	3	3	3	1,537–2,040
Yellow-bellied Gerygone <i>Gerygone chrysogaster</i>			2			73–111
Green-backed Gerygone <i>Gerygone chloronota</i>	1	1	1			73–1,244
Fairy Gerygone <i>Gerygone palpebrosa</i>	3	2	1			732–1,317
Treefern Gerygone <i>Gerygone ruficollis</i>		2	1	1	2	1,317–1,701
Large-billed Gerygone <i>Gerygone magnirostris</i>			1			111
Grey-streaked Flycatcher <i>Muscicapa griseisticta</i>			1			73
Sooty Thicket Fantail <i>Rhipidura threnothorax</i>	2		2			73–1,113
White-bellied Thicket Fantail <i>Rhipidura leucothorax</i>			2			73–111
Rufous-backed Fantail <i>Rhipidura rufidorsa</i>	3		2			73–723
Dimorphic Fantail <i>Rhipidura brachyrhyncha</i> *		2	3		2	1,390–1,701
Chestnut-bellied Fantail <i>Rhipidura hyperythra</i>	3		2			750–900
Black Fantail <i>Rhipidura atra</i> *	2	3	3	3	4	1,055–1,851
Friendly Fantail <i>Rhipidura albolimbata</i> *		3	3	3	4	1,265–2,040
Northern Fantail <i>Rhipidura rufiventris</i>			2		1	73–350
Black Monarch <i>Monarcha axillaris</i> *	4	2	2	1	1	732–1,290
Black-winged Monarch <i>Monarcha frater</i>	2	2	1		1	1,040–1,317
Spot-winged Monarch <i>Monarcha guttulus</i>			1			73–111
Hooded Monarch <i>Monarcha manadensis</i>					1	271
Golden Monarch <i>Monarcha chrysomela</i>	2		1			111–1,047
Rufous-collared Monarch <i>Arses insularis</i>	2		3			73–1,047
Shining Flycatcher <i>Myiagra alecto</i>			2		1	73–111
Yellow-breasted Boatbill <i>Machaerirhynchus flaviventris</i>	2		2			73–1,113
Black-breasted Boatbill <i>Machaerirhynchus nigripectus</i> *		2	3	2	1	1,390–1,912
Torrent Flyrobin <i>Monachella muelleriana</i>	1	1	1			271–1,016
Olive Flyrobin <i>Microeca flavovirescens</i>			3			73–111
Canary Flyrobin <i>Microeca papuana</i> *		2	2		1	1,338–2,040
White-faced Robin <i>Tregellasia leucops</i>	4	1	1		1	610–1,290
Garnet Robin <i>Eugerygone rubra</i> *		1	1	1	1	1,652, 1,662
Ashy Robin <i>Poecilodryas albispecularis</i> *		3		1	3	1,137–1,698
Black-sided Robin <i>Poecilodryas hypoleuca</i>			4			73–111
Black-chinned Robin <i>Poecilodryas brachyura</i>			1			500–600
Northern Scrub Robin <i>Drymodes superciliaris</i>	2		1		1	610–1,198
Lesser Ground Robin <i>Amalocichla incerta</i> *		4	2	4	4	1,302–1,942
White-rumped Robin <i>Peneothello bimaculata</i>	3		1			610–762
Smoky Robin <i>Peneothello cryptoleuca</i> *		4	4	4	4	1,415–2,175
Slaty Robin <i>Peneothello cyanus</i> *		4	1		2	1,183–1,430
Green-backed Robin <i>Pachycephalopsis hattamensis</i>	4	2	2		3	651–1,238
Goldenface <i>Pachycare flavogriseum</i> *	3	2			1	854–1,363

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Regent Whistler <i>Pachycephala schlegelii</i> *	1	3	3	4	4	1,189–1,912
Grey Whistler <i>Pachycephala simplex</i>	2	1	2			73–1,244
Rusty Whistler <i>Pachycephala hyperythra</i>	4	2	3		1	640–1,281
Rufous-naped Whistler <i>Pachycephala rufinucha</i> *		3	4	4	2	1,326–2,040
Little Shrikethrush <i>Colluricincla megarrhyncha</i>	2	2	2			73–1,311
Variable Pitohui <i>Pitohui kirhocephalus</i>	4		4		2	73–1,174
Hooded Pitohui <i>Pitohui dichrous</i>	3	1	2		2	1,158–1,320
Crested Pitohui <i>Pitohui cristatus</i>	2		2			350–1,150
Rusty Pitohui <i>Pitohui ferrugineus</i>	2		3			73–970
Black Pitohui <i>Pitohui nigrescens</i> *		3	2	1	2	1,244–1,912
Lemon-breasted Berrypecker <i>Melanocharis longicauda</i>	4	2	1		1	1,047–1,354
Black Berrypecker <i>Melanocharis nigra</i>	4		1		1	73–1,047
Fan-tailed Berrypecker <i>Melanocharis versteri</i> *		3	3	3	2	1,265–2,040
Spotted Berrypecker <i>Rhamphocharis crassirostris</i> *		1	1		1	1,145–1,698
Olive-crowned Flowerpecker <i>Dicaeum pectorale</i>		2	2			73–1,250
Tit Berrypecker <i>Oreocharis arfaki</i> *		4			1	1,637–2,040
Black Sunbird <i>Nectarinia aspasia</i>				2		73–271
Black-crowned White-eye <i>Zosterops atrifrons</i>	3		1			1,198
Capped White-eye <i>Zosterops fuscicapilla</i> *	3	3	1		1	1,113–1,375
Olive Straightbill <i>Timeliopsis fulvogigula</i> *		1	1	2	1	1,646–1,677
Long-billed Honeyeater <i>Melilestes megarrhynchus</i>	2		3		1	73–884
Green-crowned Longbill <i>Toxorhamphus novaeguineae</i>	4		3		2	73–1,238
Plumed Longbill <i>Oedistoma iliolophum</i>	2		1		1	701–1,037
Pygmy Longbill <i>Oedistoma pygmaeum</i>	1		1			854–1,047
Red Myzomela <i>Myzomela cruentata</i>	2		1		1	884–1,652
Black Myzomela <i>Myzomela nigrita</i>	1		1			884
Red-collared Myzomela <i>Myzomela rosenbergii</i> *		2	4	4	2	1,442–1,680
Forest Honeyeater <i>Meliphaga montana</i>	4	1	1		1	350–1,020
Hill-forest Honeyeater <i>Meliphaga orientalis</i>	3	1	1		1	781–1,244
Puff-backed Honeyeater <i>Meliphaga aruensis</i>				2		73
Mimic Honeyeater <i>Meliphaga analoga</i>				2		73
Obscure Honeyeater <i>Lichenostomus obscurus</i>	1					610–884
Spotted Honeyeater <i>Xanthotis polygrammus</i>	2					884–1,113
Tawny-breasted Honeyeater <i>Xanthotis flaviventer</i>	3		3			73–1,158
Plain Honeyeater <i>Pycnopygius ixoides</i>	2		2			692–969
Streak-headed Honeyeater <i>Pycnopygius stictocephalus</i>				3		73–111
Meyer's Friarbird <i>Philemon meyeri</i>	3		3			73–1,122
Helmeted Friarbird <i>Philemon buceroides</i>				4		73–271
Mayr's Honeyeater <i>Ptiloprora mayri</i> *		4	4	4	4	1,152–2,040
Cinnamon-browed Honeyeater <i>Melidectes ochromelas</i> *		2	3	3	4	1,174–1,912
Wattled Smoky Honeyeater <i>Melipotus carolae</i> *	1	4	1	2	3	1,113–2,040
Blue-faced Parrot-Finch <i>Erythrura trichroa</i>		1?	1	1	1	1,652–1,707

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Streak-headed Munia <i>Lonchura tristissima</i>			1			73
Metallic Starling <i>Aplonis metallica</i>			2			73–111
Golden Myna <i>Mino anais</i>			1			73–111
Yellow-faced Myna <i>Mino dumontii</i>	1		2		2	73–692
Brown Oriole <i>Oriolus szalayi</i>	1		2		1	73–781
Pygmy Drongo <i>Chaetorhynchus papuensis</i>	4	2	1		1	651–1,311
Spangled Drongo <i>Dicrurus bracteatus</i>			4			73–271
Torrentlark <i>Grallina bruijnii</i>			2		1	1,015–1,338
Great Woodswallow <i>Artamus maximus</i>		1	2		2	1,637–1,652
Hooded Butcherbird <i>Cracticus cassicus</i>			2			73
Black Butcherbird <i>Cracticus quoyi</i>			2			73
Clicking Shieldbill <i>Peltops blainvillii</i>			2			73–271
Tinkling Shieldbill <i>Peltops montanus</i>	2	2	1		1	610–1,652
White-eared Catbird <i>Ailuroedus buccoides</i>			2			73–110
Black-eared Catbird <i>Ailuroedus melanotis</i>	1		1		2	500–1,112
Golden-fronted Bowerbird <i>Amblyornis flavifrons</i> *	1	3	3	3	4	969–2,034
Masked Bowerbird <i>Sericulus aureus</i>		1	1			400–1,473
Glossy-mantled Manucode <i>Manucodia ater</i>			1			73–111
Crinkle-collared Manucode <i>Manucodia chalybatus</i>			1		1	1,145
Trumpet Manucode <i>Manucodia keraudrenii</i>	3	2	1		1	884–1,378
Magnificent Riflebird <i>Ptiloris magnificus</i>	2		2		1	73–1,155
Twelve-wired Bird-of-Paradise <i>Seleucidis melanoleucus</i>			2			73–400
Black-billed Sicklebill <i>Drepanornis albertisi</i> *	2	2	1	1	1	970–1,750
Pale-billed Sicklebill <i>Drepanornis bruijnii</i>			2		1	73–111
Black Sicklebill <i>Epimachus fastosus</i> *			3	2	2	1,410–1,775
Bronze Parotia <i>Parotia berlepschi</i> *		2	2	2	1	1,268–1,701
King Bird-of-Paradise <i>Cicinnurus regius</i>			2		1	73–111
Magnificent Bird-of-Paradise <i>Cicinnurus magnificus</i>	4	1	2		1	651–1,311
Lesser Bird-of-Paradise <i>Paradisaea minor</i>	2		3		2	73–1,150
Grey Crow <i>Corvus tristis</i>	2	1	3		1	73–1,039
Foja records requiring better documentation						
Mountain Kingfisher <i>Halcyon megarhyncha</i> *					1	1,652
Yellow-eyed Cuckooshrike <i>Coracina lineata</i>			1			700
Bicoloured Mouse Warbler <i>Crateroscelis nigrorufa</i> *					1	1,652
Grey Gerygone <i>Gerygone cinerea</i> *		1				1,265
Vogelkop Whistler <i>Pachycephala meyeri</i> *		1				1,637

*numbered coding: 4 = abundant, 3 = common, 2 = uncommon, 1 = rare